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A STUDY ON THE APPLICABILITY OF PROPOSED SWINE POST-MORTEM INSPECTION TO SOWS/BOARS

REPORT

FEBRUARY 1981

UNITED STATES DEPARTMENT OF AGRICULTURE
FOOD SAFETY AND QUALITY SERVICE
MEAT AND POULTRY INSPECTION PROGRAM
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A STUDY ON THE APPLICABILITY OF PROPOSED
SWINE POST-MORTEM INSPECTION TO SOWS/BOARS

SUMMARY

The effectiveness of a newly proposed set of swine post-mortem inspection procedures was compared at a sow slaughtering plant with the procedures outlined in the Meat and Poultry Inspection Manual. No significant differences in effectiveness were found between the two sets of procedures. The preliminary workload analysis conducted during the study indicated that the proposed method of inspection will result in increased inspectors' productivity.

It is recommended that the proposed inspection procedures be implemented at plants slaughtering sows and/or boars.

1. OBJECTIVE

The objective of this study was to compare the effectiveness of a newly proposed set of swine post-mortem inspection procedures with those outlined in the Meat and Poultry Inspection (MPI) Manual.

While effectiveness tests were being conducted, a training division officer performed a training task analysis (see Appendix A) and a work measurement staff member performed a preliminary workload analysis (see Appendix B) of the new procedures. The study was conducted at a plant slaughtering sows. A prior study was done on market hogs.

II. PROBLEM

The primary purpose of post-mortem inspection is to detect signs of disease and other unwholesome conditions that may render the carcass or parts unfit for human food. Carcasses and parts determined to be unwholesome are condemned and properly disposed of, and are not permitted for sale as human food.

Routine post-mortem inspection of swine is divided into three phases: head inspection, viscera inspection, and carcass inspection. During each of these phases, an inspector performs specific inspection procedures which involve a sequence of observing, palpating and, in case of head inspection, incising tissues. These procedures, which are outlined in the MPI Manual, have proved to be a workable and acceptable method of inspection.

In recent years, all areas of government have been under pressure by taxpayer groups and others to improve the efficiency of government programs. Planning staffs in MPI have been given an ongoing mandate to seek out the

most effective and efficient methods to inspect animals at slaughter. The new procedures studied during this test may help to meet this mandate by offering a more efficient method of swine post-mortem inspection and, if adopted, they will (1) reduce the time required to complete inspection, (2) decrease inspectors' fatigue, (3) facilitate more efficient utilization of inspectors, and (4) achieve inspection quality that is at least equal to that of the current procedures and thereby assure consumer protection.

III. METHODOLOGY

In general, the number of inspectors assigned to swine post-mortem inspection at a given plant is related to the size of the plant and the speed of operation. In small plants with a slow slaughter rate, one inspector may complete all inspection procedures (head, viscera, carcass) on each carcass. In larger plants with faster line speeds, there are three inspection sites or "stations," one each for head, viscera, and carcass.

A. Head Inspection. There were two head inspectors at the test plant and each inspector examined every other carcass. The hogs were shaved, cleaned, and presented for inspection after the head was disarticulated from the carcass at the atlanto-occipital joint and left hanging freely except for a small section of the neck skin. The carcasses were suspended from a moving rail and positioned so that the back of each carcass was toward the inspector. The line speed at the plant was 450/hr.

The current head inspection procedures as outlined in the MPI Manual are:

1. As the carcass approaches, observe the back and leading side, head, and cervical muscles.

2. Incise the mandibular lymph nodes--left and right.

3. Turn the carcass and observe the trailing side and front.

The purpose of observing the carcass during steps 1 and 3 is to detect abnormalities on the outside of the carcass such as abscesses, wounds, skin lesions, etc., and to detect dressing errors such as hair, dirt, and other contaminants.

The proposed head inspection procedures tested during the field study are:

1. Observe the leading side of the head and cut surfaces.

2. Incise and observe the mandibular lymph nodes--left and right.

3. Observe the trailing side of the head.

The proposed procedures differ from the current procedures in that they eliminate the need for the inspector to observe the outside surfaces of the carcass. It is believed this can be done without sacrificing the quality of inspection because it is the responsibility of the carcass inspector, and to some extent the viscera inspector, to observe the outside surfaces of the carcass.

The proposed procedures are not intended to limit the inspector's prerogative to observe additional parts of the outer surfaces if he/she thinks it necessary. For example, if the inspector observing the head notes any abnormality such as dermatitis or a dressing error such as hair, dirt, etc., on the head, indicating the need to expand the inspection procedures to other parts of the carcass' outer surfaces, the inspector should examine the remaining surfaces.

The proposed procedures will not change any of the head inspector's other responsibilities. They will remain the same as those required under the current procedures. For example, when the inspector detects a disease condition or a dressing error that requires action on his/her part, such as tagging the carcass, the inspector will take that action.

B. Viscera Inspection. After leaving the head inspection station, the carcasses were eviscerated and positioned so that the ventral surfaces face the viscera inspectors. The viscera inspection station had two inspectors. The current inspection procedures require these inspectors to observe the eviscerated carcass for disease conditions and dressing errors and to observe and/or palpate various abdominal and thoracic structures, including the liver, spleen, lungs, heart, intestines, and lymph nodes. Other duties of the viscera inspectors include retaining carcasses for veterinary disposition and marking condemned parts.

Many steps in the proposed viscera inspection procedures are the same as those in the current procedures. For example, the proposed procedures still require the inspector to observe the eviscerated carcass for disease conditions and dressing errors. However, in the proposed procedures, this required action has an additional importance because parts of the carcass are not routinely observed by the head inspector.

The proposed viscera inspection procedures differ from the current procedures in the following steps:

Current	Proposed
1. Observe and palpate the spleen	1. Observe the parietal (top) surface of the spleen
2. Observe and palpate the dorsal (curved) surface of the liver	2. Observe the dorsal (curved) surface of the liver
3. Palpate the mediastinal nodes	3. Observe the mediastinal nodes
4. Observe and palpate the dorsal (curved) surfaces of the lungs	4. Observe the dorsal (curved) surfaces of the lungs
5. Observe and palpate the heart	5. Observe the heart

The advantage of the proposed procedures is the elimination of the requirement to palpate the spleen, liver, mediastinal nodes, lungs, and heart. It is believed that the elimination of this requirement will reduce inspector's fatigue without adversely affecting the quality of inspection for the following reasons:

1. Splenic pathology, including tuberculosis lesions and abscesses, is readily observable.

2. Liver lesions are also readily observable. Unlike the thicker bovine liver, the swine liver rarely has deep-seated abscesses.

3. Primary pathology of the mediastinal nodes, including tuberculosis, is rare in swine. Swollen nodes due to inflammatory processes and generalized disease conditions should be readily apparent by merely observing the nodes.

4. The main reason for palpating swine hearts is to detect lesions of Taenia solium cysticercus, a disease with low incidence in this country (six carcasses were condemned for this disease in fiscal year 1979). When

this disease is found in swine, the lesions are usually extensive and readily observed in the heart as well as in other muscle tissues of the carcass.

C. Carcass Inspection. The carcass inspection station at the test plant had one inspector. Carcasses were presented for inspection at this station with the kidneys exposed and with the ventral surface of the carcass facing the inspector. The current carcass inspection procedures consist of three steps:

1. Observe the outer part of leading half of carcass, cut surfaces, and body cavities--pelvic, abdominal, and thoracic.

2. Observe and palpate the kidneys.

3. Observe the lumbar and neck regions and the outer parts of the trailing half of the carcass.

The proposed carcass inspection procedures also consist of three steps; however, unlike the current procedures, they require the use of a mirror. The steps are:

1. Look in the mirror and observe the back of the carcass.

2. Observe the front parts and inside of the carcass.

3. Grasp, turn, and observe the kidneys (both sides).

As the head and viscera inspectors, the carcass inspector's remaining respons bilities will be the same as those under the current procedures. They includ verifying that localized benign conditions, such as bruises, are removed from the carcass by a plant employee and retaining carcasses with certain abnormal conditions for veterinary disposition.

All steps for the current and proposed procedures are listed in Appendix C.

D. Design and Sampling Plan. One week before the study, a training division officer was at the plant to teach the inspectors the proposed procedures. During this week, the inspectors rotated stations (head, viscera, and carcass) to become accustomed to doing the proposed procedures at each station.

To reduce possible bias due to variability of pathology and dressing errors in different lots, the test was so designed that the current and proposed procedures were evaluated simultaneously.

After a week of training, a pilot study was conducted. The purpose of this was to allow everyone (inspectors, evaluators) participating in the study to adjust to the testing process and to allow the project officer in charge to make any changes before the actual test study began. During the pilot study, data were collected and reviewed but were not included in the report.

Upon completion of the pilot study, the actual test study began. To compare the effectiveness of the two procedures, it was necessary to use more than the three obvious evaluation sites (head, viscera, and carcass stations). This was necessary because there was not sufficient space and time after each station to adequately examine the moving units. Further, the proposed head inspection procedures omit the requirement to observe the carcass.

Therefore, if the two head inspection procedures were evaluated and compared immediately after the head station, the current procedures would obviously be superior. Because the proposed procedures shift the carcass examination

responsibility from the head station to the viscera and carcass stations, it was decided that the carcass evaluation sites should be at these two stations rather than at the head station. In effect, then, the two systems were tested against each other rather than one station against another. For these reasons, five evaluation sites at the plant were selected. They were as follows:

Evaluation Site Number and Name	Location	Purpose
1. Head	- after head station	- evaluate head inspection
2. Viscera	- after viscera station	- evaluate viscera inspection
3. Viscera/carcass	- after viscera station	- evaluate carcass inspection through the viscera station
4. Kidney/leaf fat	- after carcass station and before removal from carcass	- evaluate kidney/leaf fat
5. Carcass	- after carcass station and before entering the cooler(s)	- evaluate carcass

At the viscera/carcass site, the evaluators examined the dorsal surface of the carcass to detect diseases or abnormalities (diamond skin, melanosis, abscess, etc.) that were not observed by the head inspectors using the proposed procedures and by the viscera inspectors who were only observing the carcass ventral surfaces.

Each day for 5 days, the evaluators randomly selected 400 samples at each of the five inspection sites--200 that were inspected under current inspection procedures and 200 that were inspected under proposed inspection

procedures. Altogether 10,000 samples (2,000 from each evaluation site) were evaluated and the results recorded on worksheets.

Carcasses were marked with an identification code before arriving at the head inspection station. This was done so that the same inspection procedures were used on the carcass at all three stations. Carcasses that were to be inspected with the current procedures were identified with a code and carcasses that were to be inspected with the proposed procedures were identified with another code. The codes were changed on a random basis and were known only by the project officer in charge. The evaluators examined heads, viscera, and carcasses for pathological lesions and dressing errors that warrant action by the inspector. Each lesion or error missed by inspectors were recorded and tallied on worksheets (see Appendix E), following the instructions provided (see Appendix D).

The rotation pattern for the five evaluation sites was randomly determined daily. Because the plant had short work days during the testing period some of the evaluations were combined. For example, the head and viscera/carcass evaluations were conducted at the same time as the viscera and kidney/leaf fat evaluations. This reduced the amount of time needed to complete the required number of evaluations and assured that there was enough time to collect all samples needed for the study.

E. Testing. Testing was done as follows:

1. Head Station. Evaluation #1. One evaluation (#1, head evaluation) was performed at the head station. One of the two head inspectors used

the current procedures and the other inspector used the proposed procedures.

Every other carcass was identified with the current procedure code, and these carcasses were inspected by the inspector using the current procedures. The other carcasses were identified with the proposed procedure code, and these carcasses were inspected by the inspector using the proposed procedures.

Afer the heads were inspected, they were examined on the line by a veterinary evaluator (Veterinary Evaluator 1) who was standing down the line from the head inspectors. Results of the evaluator's findings were recorded on Worksheet No. 1 by another veterinary evaluator (Veterinary Evaluator 2) who was standing in the same area. In addition to serving as a recorder, Veterinary Evaluator 2 was occasionally asked by Veterinary Evaluator 1 to look at questionable lesions so that a more accurate diagnosis could be made. The evaluators also had the option of retaining a carcass and head when necessary for closer examination.

To prevent bias, the evaluators were positioned far enough down the line that they could not see the type of inspection procedures used at the various stations. Also, they were not given the marking codes that identified the type of procedures used on the heads. They were simply told to randomly select and evaluate 200 heads marked with each code.

Random selection at each evaluation site was done as follows: The evaluator was told to select a unit as it went by on the line. This unit was not examined but served as a starting point. The evaluator then selected the

fifth unit following this starting point as the first unit to be examined for the study. The evaluator examined the unit, noted the identification code, and recorded the errors on the appropriate worksheet. After this was done, the evaluator selected the first available unit with the opposite identification code, examined it, and recorded the findings on the appropriate worksheet. This alternate selection continued until the required number of units was evaluated.

2. Viscera Station. Two evaluations (#2, viscera evaluation and #3, dorsal viscera/carcass evaluation) were performed at the viscera station. The results of these two evaluations were recorded on separate worksheets. The evaluations were done as follows:

Evaluation #2. As at the head station, one of the two viscera inspectors used the current procedures; the other used the proposed procedures. This ensured that the same procedures were used on the carcass at the viscera station as were used at the head station. The evaluators were positioned down the line from the inspectors and were separated from them by a shield (see Appendix F, Illustration 2).

Sets of viscera were identified by relating the viscera to the code markings on the carcasses; therefore, the evaluators did not know which procedures were being used on the viscera they were evaluating. The evaluators randomly selected and evaluated 200 sets of viscera inspected under the current procedures and 200 sets of viscera inspected under the proposed procedures. Results were recorded on Worksheet No. 2.

Evaluation #3. The arrangement of inspectors at the head and viscera stations was the same as for Evaluation #2. The evaluators positioned themselves behind the moving carcasses so that the dorsal surface of the carcass could be examined. A shield was placed between the evaluators and the inspectors (see Appendix F, Illustration 3). The evaluators randomly selected carcasses and examined them to determine whether the head and/or viscera inspectors missed any carcass conditions, such as diamond skin, that would require the carcass and its viscera to be retained for veterinary disposition. The results of the examination were recorded on Worksheet No. 3. Carcass evaluation at the viscera station was necessary to determine whether the proposed procedures are as effective as the current procedures for detecting conditions that would require carcasses to be retained for veterinary disposition.

3. Carcass Station. The arrangement of the inspectors at the head and viscera stations was the same as that described in Evaluation #2. The carcass inspector used the current procedures on those carcasses identified with the current procedure code, and used the proposed procedures on those carcasses identified with the proposed procedure code. This assured that the same procedures were used on each carcass at all three stations. Because of plant layout and the leaf fat and kidneys were removed from the carcass before the entire carcass could be evaluated, it was necessary to divide the carcass station evaluation into two parts. The kidneys and leaf fat were evaluated just before they were removed from the carcass by plant employees (Evaluation #4) and the rest of the carcass (dressed carcass) was evaluated just before it entered the cooler(s) (Evaluation #5). These two parts were evaluated separately and the results were recorded on separate worksheets.

Evaluation #4. The evaluators positioned themselves behind the shield so that they could not observe the carcass inspector (see Appendix F, Illustration 4).

They randomly selected and evaluated the kidneys and leaf fat from 200 carcasses that received the current procedures and from 200 carcasses that received the proposed procedures. Results were recorded on Worksheet No. 4.

Evaluation #5. The shield was not necessary for this evaluation because the evaluators were standing far enough down the line that they could not observe the type of inspection procedures used at the various stations. An extra evaluator was used for this evaluation to assure that the entire carcass could be examined in sufficient detail (see Appendix F, Illustration 5). Two hundred carcasses that received the current procedures and 200 carcasses that received the proposed procedures were randomly selected and evaluated. Results were recorded on Worksheet No. 5.

At each of the five evaluation sites (heads, viscera, viscera/carcass, kidney/leaf fat, and dressed carcass) the evaluators repeated the same sequence of randomly selecting and evaluating 200 samples that received current inspection and 200 samples that received proposed inspection. At the end of each day, 2000 samples from both procedures were randomly selected and evaluated by the evaluators and the results of the evaluations were recorded on the five evaluation worksheets.

F. Variability/Bias. To prevent or reduce variability and bias, the following steps were taken:

1. Assignments were made so that, during the test, inspectors rotated stations and each inspector had a turn at using both the proposed and current inspection procedures at each station.

2. The evaluators alternated duties at each station so that one first served as an evaluator and then as a recorder.

3. The current and proposed procedures were evaluated simultaneously and carcasses of animals from the same lots were used for both procedures.

4. A shield was placed between evaluators and inspectors.

5. The marking codes identifying the current and proposed procedures were not revealed to the evaluators.

G. Backup Inspection. To assure that product inspected by the proposed procedures met the standards for wholesomeness, all heads, viscera, and carcasses subjected to the proposed procedures during testing received an additional inspection, which provided the current procedures that were omitted. This "backup" inspection was performed down the line from the evaluators.

IV. RESULTS AND STATISTICAL ANALYSIS

The Mathematics and Statistics Division provided an analysis of the data collected during the study. The percent accuracy and confidence interval by evaluation site and type of errors are listed in Table 1, Percent Accuracy and Confidence Interval (CI). This table includes:

Column 1 - Evaluation sites

Column 2 - Total number of samples evaluated

Table 1 - Percent Accuracy and Confidence Interval (CI)

Evaluation Site	Samples Evaluated	Type of Errors	Current Procedures			Proposed Procedures		
			Samples with no Errors		95% CI	Samples with no Errors		95% CI
			Total	Percent		Total	Percent	
Head	1000	Pathology	998	99.8	99.5, 100	999	99.9	99.7, 100
		Dressing	889	88.9	87.0, 90.8	878	87.8	85.8, 89.8
		TOTAL	888	88.8	86.8, 90.8	877	87.7	85.7, 89.7
Viscera	1000	Pathology	994	99.4	98.9, 99.9	994	99.4	98.9, 99.9
		Dressing	996	99.6	99.2, 100	993	99.3	98.8, 99.8
		TOTAL	990	99.0	98.4, 99.6	987	98.7	98.0, 99.4
Viscera/ Carcass	1000	Pathology	992	99.2	98.6, 99.8	979	97.9	97.0, 98.8
		TOTAL	992	99.2	98.6, 99.8	979	97.9	97.0, 98.8
Kidney/ Leaf Fat	1000	Pathology	967	96.7	95.6, 97.8	967	96.7	95.6, 97.8
		Dressing	987	98.7	98.0, 99.4	984	98.4	97.6, 99.2
		TOTAL	954	95.4	94.1, 96.7	952	95.2	93.9, 96.5
Carcass	1000	Pathology	973	97.3	96.3, 98.3	983	98.3	97.5, 99.1
		Dressing	918	91.8	90.1, 93.5	946	94.6	93.2, 96.0
		TOTAL	901	90.1	88.2, 92.0	933	93.3	91.8, 94.8

Column 3 - Type of errors

Column 4 - Number of samples evaluated from the current procedures with no errors

Column 5 - Percent of samples evaluated that were free from errors (column 4 divided by column 2) from the current procedures

Column 6 - The 95 percent confidence interval on the percent of samples evaluated that were free from errors on current procedures

Column 7 - Number of samples evaluated from the proposed procedures with no errors

Column 8 - Percent of samples evaluated that were free from errors (column 4 divided by column 2) from the proposed procedures

Column 9 - The 95 percent confidence interval on the percent of samples evaluated that were free from errors on the proposed procedures

A 95 percent confidence interval is listed for each percentage. It is reasonably certain that the true number of error free units is contained in that interval. If the intervals overlap, there is no evidence of a difference in error rates. All intervals overlap for dressing, pathological, and total errors. Therefore, the difference in error rates between the proposed and current procedures is not statistically significant.

V. LIMITATIONS

The plant sampled in this study was not randomly selected. It was selected on the basis of several factors, such as (1) adequate facilities to locate evaluators at evaluation sites, (2) available lighting and platforms at such sites, (3) chain speed and daily slaughter to sample and evaluate required

number of units, plant management cooperation, etc. Therefore, inferences can be made only to the plant selected. Inferences to other plants are judgmental.

The line speed at the plant was its normal operating line speed.

The proposed method of inspection was used during one week of familiarization as compared to the ongoing standard procedures.

Only sows were evaluated in this study.

If a carcass (viscera/head) was tagged, it was assumed that the inspector noted all lesions and dressing errors for which the carcass should have been tagged.

Since the current and proposed procedures were done simultaneously at the head inspection station, it may be assumed the proposed procedures were given a slight advantage. Inspectors using the current procedures might have stopped the line more often because they were observing the carcass. Therefore, they had an opportunity to see more contamination and take action. The plant, in turn, might have taken action on all carcasses, which would have given advantage to the proposed procedures. However, this sampling plan was used because the amount of variability was smaller than the variability that would have existed if the two procedures were tested on separate lots.

VI. RECOMMENDATIONS

The majority of the study team members feel that the proposed inspection procedures should be implemented. This conclusion is based on: (1) the

effectiveness of the proposed system being equal to that of the current system at the tested line speed for sows as shown in the study and (2) the preliminary workload analysis indicating that the proposed method of inspection will result in increased productivity without increase in inspection staffing. Further work measurement analysis should be conducted, however, to determine a more accurate staffing requirement.

A Study on the Applicability of Proposed

Swine Post-Mortem Inspection to Sows/Boars

APPENDIX

Appendix A - Training Task Analysis

While the test study was being conducted, a Training Division Officer performed a detailed task analysis of the proposed inspection procedures.

The task analysis, which describes the work to be done in performance terms, is a critical step in the development of any training endeavor. It enables the trainer to describe training objectives and to determine the most appropriate instructional setting to accomplish these objectives. The task analysis may be used to develop self-instructional lessons or guides that are sufficiently explanatory so that all trainees can correctly perform the assigned tasks as required by the program. The production of any self-instructional materials requires the prior approval of job requirements that are derived from an accurate, approved task analysis. Following are the estimated job requirements for both the food inspector and the veterinary medical officer:

Assigned to an establishment using approved post-mortem inspection procedures, veterinary medical officer will be able to:

1. Identify the facility requirements of the approved procedures, the optimum line speeds allowed, and other limits within the approval for the revised procedures.

2. Tell inspectors what the measurable standards are in the approval for that facility (line speeds and other limits) and provide them with the proper corrective action to take when these are not met.

3. In measurable terms, tell the inspectors what the operational sanitation requirements are for each of the inspection stations and provide them with the proper corrective actions to take when these are not met.

4. In measurable terms, tell the inspectors what the product presentation standards are for each inspection station and provide them with the proper corrective actions to take when these are not met.

5. In measurable terms, tell the inspector at each of the inspection stations what is required of him/her at that inspection station. Explain to each what the standards are for doing an acceptable job and provide feedback to meet and maintain this level.

6. Identify the critical elements of the job that would indicate the inspection procedures are not being carried out with satisfactory results. Check for product that has been condemned yet meets minimum MPI requirements and for product passed for human food that should have been either condemned or retained for veterinary disposition. Tell the inspector what the standards are and provide feedback to meet and maintain them.

7. Observe the dressing procedures being used by the establishment. Identify any area where controls are needed to assure that the product is not adulterated. Tell the inspectors what the standards are for these controls and provide them with the proper corrective action expected. Provide feedback to meet and maintain them.

8. Observe the plant trimming operations at the inspection stations. Tell inspectors what corrective action should be taken if trimmers are not trimming correctly.

9. Recognize diseased and abnormal conditions that do not meet the minimum MPI requirements for human food and make proper disposition of these carcasses based on current MPI disposition criteria.

10. Point out to plant management the standards that the establishment must meet under the approved revised inspection procedures for the carcasses produced to meet minimum product requirements.

A food inspector assigned to a post-mortem inspection station using the revised procedures will be able to:

1. Determine when the facilities and minimum station requirements are not being met and take the proper corrective action.

2. Determine when minimum standards for operational sanitation are not being met and take the proper corrective action.

3. Determine when minimum standards for product presentation for inspection are not being met and take the proper corrective action.

4. Conduct post-mortem inspection at each of the three inspection stations in a way that swine, or parts thereof, are properly condemned, retained or passed.

5. Direct work of the plant trimmer to assure that minimum MPI requirements are met.

Appendix B - Preliminary Workload Analysis

Objective: To estimate workload requirements for inspecting swine with the proposed swine post-mortem inspection procedures and to establish preliminary time standards for the approved revised procedures. The test slaughter inspection configurations consisted of a three inspection team arrangement: one head, one viscera and one carcass (rail).

Project Plan

The project required three tasks--head, viscera, and carcass inspection (interior/exterior). The procedure used for each of the three tasks was a manual one. A film study, involving the following steps, was performed:

1. The inspectors were filmed performing the proposed inspection procedures under actual operating conditions. This included filming of different inspectors at each of the inspection stations. The project manager, or his designated representative, verified that the inspectors were performing the prescribed procedures, recommended when films should be taken, and arranged for whatever rotations of inspectors between inspection stations were deemed appropriate for filming.

2. Filming of inspectors performing the proposed inspection procedures was reviewed by the project manager and his representative, who identified the scenes to be used in development of the preliminary standard times.

3. Films were analyzed to obtain a description of the inspection method and to obtain preliminary time values. In addition, a determination of the appropriate difficulty adjustments was made.

4. A pace rate was done on the physical motions. For the proposed procedures, the work standards staff rated these films.

5. The preliminary time standard for performing the swine post-mortem inspection procedures was calculated.

6. The study was documented.

Resources Required

To accomplish this preliminary workload analysis, assistance was required. of the project manager, his designated representative(s) and food inspectors--all of whom have experience in swine post-mortem inspection. The project manager, or his designee, was on site during the study to indicate which inspectors performing the swine post-mortem inspection procedures had to be filmed.

The project manager scheduled the dates when filming was conducted. Data on operations such as hand washing, knife steeling, etc., for each inspection station, were obtained for inclusion in computation of the preliminary time standard. For the development of the actual time standard for the proposed inspection procedures, additional films of inspectors will be required, pace raters will need to be designated and trained, and selected scenes will have to be analyzed and prepared as a rating film.

Increased Productivity

This preliminary study indicates that the proposed post-mortem inspection procedure changes should increase potential inspector productivity by

27% to 45% in mechanized slaughter operations with a three (or greater) inspector configuration. This productivity improvement will be obtained by eliminating unnecessary motions and inspection elements and by requiring correct presentation procedures. A specific prediction of the increased productivity cannot be made at this time. After the proposed procedures have been implemented, additional data will be collected and analyzed to determine the exact productivity improvement.

Appendix C - Swine Post-Mortem Inspection Procedures

Inspection Station	Step	Current	Step	Proposed 1/
Head		Examine carcasses for proper cleaning.		
	1.	Observe -Back and leading side (as carcass approaches). -Head and cervical muscles.	1.	Observe head and cut surfaces.
	2.	Incise mandibular lymph nodes--left and right.	2.	Incise and observe mandibular lymph nodes--left and right.
	3.	Turn carcass and observe trailing side and front.	3.	Observe/retain carcass, when required.
	4.	Retain carcass, when required.		
Viscera		Observe carcasses and, as much as possible, methods of handling carcasses and parts.		
	1.	Observe -Eviscerated carcass. -Viscera, rectum, and associated lymph nodes.	1.	Observe -Eviscerated carcass -Viscera -Parietal (top) surface of spleen
	2.	Observe and palpate spleen and mesenteric lymph nodes.	2.	Observe and palpate mesenteric lymph nodes.
	3.	Palpate portal lymph nodes.	3.	Palpate portal lymph nodes.
	4.	Observe and palpate dorsal (curved) surface of liver.	4.	Observe dorsal surfaces of lungs.
	5.	Turn liver over and observe ventral (flat) surface.	5.	Palpate bronchial lymph nodes--right and left.
	6.	Palpate bronchial lymph nodes--right and left.	6.	Observe mediastinal lymph nodes.
	7.	Observe and palpate dorsal (curved) surfaces of lungs.	7.	Turn lungs over and observe ventral surfaces.
	8.	Palpate mediastinal lymph nodes.	8.	Observe heart.
	9.	Turn lungs over and observe ventral (flat) surfaces.	9.	Observe dorsal surface of liver.
	10.	Observe and palpate heart.	10.	Turn liver over and observe ventral surface.
	11.	Condemn viscera or parts, when required.	11.	Condemn viscera or parts, when required.
	12.	Retain carcass, viscera and parts, when required.	12.	Retain carcass, viscera and parts, when required.
Carcass	1.	Observe -Outer part of leading half of carcass -Cut surfaces and body cavities--pelvic, abdominal, thoracic.	1.	Look in mirror and observe back of carcass.
	2.	Observe and palpate kidneys.	2.	Observe front parts and inside of carcass.
	3.	Observe -Lumbar and neck regions. -Outer part of trailing half of carcass.	3.	Grasp, turn, and observe kidneys (both sides).
	4.	Direct trim, remove retain tags, or retain carcass when required.	4.	Direct trim, remove retain tags, or retain carcass when required.

1/ Inspectors must examine carcasses, organs, and parts for diseases, abnormalities, cleanliness.

Appendix D - Instructions for Use of Worksheets

It is important to note that these forms are worksheets and, therefore, it is not necessary to prepare copies.

These worksheets are designed according to the functions involved at the head, viscera, and carcass (rail) inspection stations, and are intended to be used for recording data necessary to test and analyze the feasibility of new swine post-mortem inspection procedures. Use each sheet for 100 evaluations.

Worksheets No. 1 through No. 5 are to be used for current and proposed procedures at five evaluation sites.

Each worksheet includes categories and subcategories. For each, the information recorded should show (1) tallied units examined, (2) tallied and total units with errors, and (3) total errors.

Evaluation of the two procedures is to be accomplished at five sites: head immediately after head inspection; viscera immediately after viscera inspection; viscera/carcass after viscera inspection; kidney/leaf fat after carcass inspection and before their removal; and carcass after carcass inspection and dressing.

The Project Officer in Charge should determine where, when, and how the units can be selected, notify the inspector in charge, the inspectors, and plant representative, and instruct the evaluators.

As instructed, examine 100 units for each procedure. Test only sows/ boars, do not include market hogs.

The units should be selected as randomly as possible throughout the day's operation.

One unit is represented by carcass and head at the head inspection station, one viscera set and corresponding carcass at the viscera inspection station, and both sides of a carcass at the carcass inspection station.

The numbers 1-15 across the top of the page do not indicate the first, second, etc., head (carcass/viscera); they specify only those heads (carcasses/viscera) with errors. Score all head (carcass/viscera) errors on the first head (carcass/viscera) found with errors in column 1, the second one in column 2, etc. Tally each unit examined by placing a slash in each of the 100 circles at the bottom of each sheet to keep track of how many have been evaluated. If one unit does not have an error, or if no error is noted for a category or subcategory while one unit is inspected by inspection personnel, enter one tally in the units examined space. Score under pathology or dressing errors only those heads (carcasses, viscera) with errors. If one or more errors are noted in one unit, tally them in the appropriate space next to the category or subcategory, i.e. if a head (carcass/viscera) has several errors, score them all in the same column. If several errors are of the same type, indicate the number in the appropriate box. For example, if the first head with errors has one Tuberculosis lesion and two contamination

errors, score in column 1 a 1 beside Tuberculosis and a 2 beside contamination.

Some categories, such as hair and scurf, have definite guidelines spelled out; others, such as skin conditions, contamination (feces, urine, ingesta, bile), etc., have not. Tally them when the error is of sufficient extent that correction would have been called for if it had been recognized at the point of inspection (head, viscera, carcass).

Where listed, the category "Other" is to score or identify errors which may not be scored under other categories or subcategories, or to identify an error which may be considered a particular problem.

Complete all items. If a category or subcategory is not applicable in a particular test, enter "NA" and explain in the appropriate space or in the "Remarks" space.

Evaluators are to sign each sheet. The project officer in charge is to sign each sheet after he checks all entries and computes the row totals.

All testing and evaluating procedures should be done without causing plant operations disruption.

Instructions for Use of Each Worksheet

Worksheet No. 1

1. Abscess-retain unit (head and carcass).

2. Tuberculosis--retain unit (head and carcass).
3. Laceration/bruises--score those 2½ inches or more in diameter.
4. Hair/scurf--score clumps and/or patches 1 inch or more in any direction.
5. Rosin/oil/grease--score spots of any amount.
6. Overscald/burns--score those of any size.
7. Arthritis--do not record on head inspection evaluation.
8. Head missing--do not count unit.
9. Lymph node(s) missing--do not count unit.
10. Lymph node(s) not incised--do not count unit. Record under "remarks."

Worksheet No. 2

1. Tuberculosis--retain unit (head/viscera/carcass).
2. Septicemia/pyemia--tally under "other pathology" and enter under "remarks."
3. Enlarged liver--tally under "other pathology" and enter under "remarks."
4. Specific disease (diagnosis made)--tally under "other pathology" and enter under "remarks."

Worksheet No. 3

1. Tally diseases or conditions requiring veterinary disposition.
2. Tally under "other" any condition which would cause contamination if not removed.

Worksheet No. 4

1. Kidneys--consider both kidneys as one unit.

2. Kidney(s) missing--tally unit as acceptable.
3. One kidney missing, one with one abscess--tally as one unit with one error.
4. One kidney with two abscesses, one with three cysts--tally as one unit with two abscesses and three cysts.
5. Other kidney conditions--tally error(s) under "other" and write condition(s) under "remarks."
6. Leaf fat--consider both sides as one unit (carcass is split).
7. Kidneys or leaf fat--for one kidney or both kidneys (one kidney unit), or for both sides of the leaf fat, record all lesions (all cysts, all abscesses, etc.) by tallying each lesion in the appropriate unit space.

Worksheet No. 5

1. Adhesions/bruises--tally those 2½ inches or more in diameter.
2. Incomplete trimming--tally unit; specify organ involved under "remarks."

NOTE:

1. Unit (head/viscera/carcass) retained by evaluator--tally in appropriate or "other" space and specify under "remarks."
2. Take adequate time (skip units if required) to evaluate units thoroughly.

WORKSHEET No. 1
SWINE HEAD INSPECTION

1. Est. No.	2. Location *(City, State)*	3. Chainspeed	4. Procedure ☐ Current ☐ Proposed	5. No. of Inspectors	6. Date

	CATEGORY - SUBCATEGORY	UNITS WITH ERRORS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL
PATHOLOGY	7. Abscess																
	8. Tuberculosis																
	9. Contamination *(pathological)*																
	10. Laceration, Bruises *(2½", or more in diameter)*																
	11. Skin Conditions																
	12. Other, pathology *(specify)*																
DRESSING ERRORS	13. Hair, Scurf *(clumps/ patches 1" or more in any direction)*																
	14. Rings, Ring Holes																
	15. Rosin, Oil - Grease																
	16. Contamination *(overscald, burns, ingesta, etc.)*																
	17. Incomplete Trimming *(Ear canal, eyelid, beater mark, etc.)*																
	18. Other dressing errors *(specify)*																

19. Units Examined *(Tally each unit)*

1 2 3 4 5	16 17 18 19 20	31 32 33 34 35	46 47 48 49 50	61 62 63 64 65	76 77 78 79 80	91 92 93 94 95
6 7 8 9 10	21 22 23 24 25	36 37 38 39 40	51 52 53 54 55	66 67 68 69 70	81 82 83 84 85	96 97 98 99 100
11 12 13 14 15	26 27 28 29 30	41 42 43 44 45	56 57 58 59 60	71 72 73 74 75	86 87 88 89 90	

20. Remarks

21. Signature(s) of Evaluator(s)			22. Signature of Project OIC
	B.	C.	

WORKSHEET No. 2 SWINE VISCERA INSPECTION	1. Est. No.	2. Location *(City, State)*	3. Chainspeed	4. Procedure ☐ Current ☐ Proposed	5. No. of Inspectors	6. Date

	CATEGORY - SUBCATEGORY		UNITS WITH ERRORS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL
PATHOLOGY	7. Gastrointestinal tract	a. Gastritis, Enteritis																
	8. Mesenteric nodes	a. Abscess																
		b. Tuberculosis																
	9. Spleen Lesions *(Specify)*																	
	10. Liver, Portal Nodes *(Do not include parasitic lesions)*	a. Abscess																
		b. Tuberculosis																
		c. Cirrhosis																
	11. Lungs	a. Abscess																
		b. Tuberculosis																
		c. Pneumonia																
		d. Other *(Specify)*																
	12. Bronchial Nodes	a. Tuberculosis																
		b. Other *(Specify)*																
	13. Mediastinal Nodes	a. Tuberculosis																
		b. Other *(Specify)*																
	14. Heart	a. Pericarditis																
	15. Contamination *(pathological)*																	
	16. Other Pathology *(Specify)*																	
DRESSING ERRORS	17. Contamination *(feces, urine, ingesta, bile, etc.)*																	
	18. Other Dressing Errors *(Specify)*																	

19. Units Examined *(Tally each unit)*

1 2 3 4 5	16 17 18 19 20	31 32 33 34 35	46 47 48 49 50	61 62 63 64 65	76 77 78 79 80	91 92 93 94 95
6 7 8 9 10	21 22 23 24 25	36 37 38 39 40	51 52 53 54 55	66 67 68 69 70	81 82 83 84 85	96 97 98 99 100
11 12 13 14 15	26 27 28 29 30	41 42 43 44 45	56 57 58 59 60	71 72 73 74 75	86 87 88 89 90	

20. Remarks *(If additional space is needed, use reverse)*

21. Signature(s) of Evaluator(s)			22. Signature of Project OIC
A.	B.	C.	

WORKSHEET No. 3 SWINE VISCERA/CARCASS INSPECTION	1. Est. No.	2. Location *(City, State)*	3. Chainspeed	4. Procedure ☐ Current ☐ Proposed	5. No. of Inspectors	6. Date

INSTRUCTIONS: Use for units *(viscera and/or carcasses)* retainable for diseases or conditions requiring veterinary disposition.

CATEGORY - SUBCATEGORY	UNITS WITH ERRORS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL
7. Arthritis																
8. Contamination *(pathological)*																
9. Erysipelas																
10. Injection Lesions																
11. Injuries																
12. Neoplasms																
13. Parasitic Conditions *(Specify)*																
14. Pigmentary Conditions *(Specify)*																
15. Pyemia, Septicemia																
16. Other																

17. Units Examined *(Tally each unit)*

2	3	4	5	16	17	18	19	20	31	32	33	34	35	46	47	48	49	50	61	62	63	64	65	76	77	78	79	80	91	92	93	94	95
7	8	9	10	21	22	23	24	25	36	37	38	39	40	51	52	53	54	55	66	67	68	69	70	81	82	83	84	85	96	97	98	99	100
12	13	14	15	26	27	28	29	30	41	42	43	44	45	56	57	58	59	60	71	72	73	74	75	86	87	88	89	90					

Remarks

19. Signature(s) of Evaluator(s)			20. Signature of Project OIC
	B.	C.	

WORKSHEET No. 4 SWINE KIDNEYS/LEAF FAT INSPECTION	1. Est. No.	2. Location *(City, State)*	3. Chainspeed	4. Procedure ☐ Current ☐ Proposed	5. No. of Inspectors	6. Date

CATEGORY - SUBCATEGORY		UNITS WITH ERRORS														TOTAL
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
7. Kidney Conditions	a. Cysts																
	b. Neoplasms																
	c. Abscesses																
	d. Nephritis																
	e. Other *(specify)*																
8. Leaf Fat	a. Abscess																
	b. Contamination																
	c. Other *(specify)*																

9. Units Examined *(Tally each unit)*

1	2	3	4	5	16	17	18	19	20	31	32	33	34	35	46	47	48	49	50	61	62	63	64	65	76	77	78	79	80	91	92	93	94	95
6	7	8	9	10	21	22	23	24	25	36	37	38	39	40	51	52	53	54	55	66	67	68	69	70	81	82	83	84	85	96	97	98	99	100
11	12	13	14	15	26	27	28	29	30	41	42	43	44	45	56	57	58	59	60	71	72	73	74	75	86	87	88	89	90					

10. Remarks

11. Signature(s) of Evaluator(s)			12. Signature of Project OIC
A.	B.	C.	

WORKSHEET No. 5 SWINE CARCASS INSPECTION	1. Est. No.	2. Location *(City, State)*	3. Chainspeed	4. Procedure ☐ Current ☐ Proposed	5. No. of Inspectors	6. Date

	CATEGORY - SUBCATEGORY		UNITS WITH ERRORS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL
PATHOLOGY	7. Abrasion, Adhesion, Bruise, *(2½" or more in diameter)*																	
	8. Abscess																	
	9. Arthritis																	
	10. Fracture, Laceration																	
	11. Skin Lesions *(diamond-skin urticaria, frostbite etc.)*																	
	12. Pigmentary Lesions *(melanosis, etc.)*																	
	13. Injection Lesions																	
	14. Odor *(sexual, medicinal, etc.)*																	
	15. Contamination *(Pathological)*																	
	16. Other Pathology *(specify)*																	
DRESSING ERRORS	17. Hair, Scurf *(clumps/patches 1" or more in any direction); claws*																	
	18. Incomplete Trimming *(penis, udder, lungs, liver, etc.)*																	
	19. Stick Wounds																	
	20. Contamination *(rosin, oil-grease, feces, ingesta, etc.)*																	
	21. Other Dressing Errors *(specify)*																	

22. Units Examined *(Tally each unit)*

1 2 3 4 5	16 17 18 19 20	31 32 33 34 35	46 47 48 49 50	61 62 63 64 65	76 77 78 79 80	91 92 93 94 95	
6 7 8 9 10	21 22 23 24 25	36 37 38 39 40	51 52 53 54 55	66 67 68 69 70	81 82 83 84 85	96 97 98 99 100	
11 12 13 14 15	26 27 28 29 30	41 42 43 44 45	56 57 58 59 60	71 72 73 74 75	86 87 88 89 90		

23. Remarks *(If additional space is needed, use reverse)*

11. Signature(s) of Evaluator(s)			12. Signature of Project OIC
A.	B.	C.	

Appendix F - Inspection Stations and Evaluation Sites

KEY: I_c = inspector using current procedure

I_p = inspector using proposed procedure

E-1 = evaluator #1 E-3 = evaluator #3

E-2 = evaluator #2

= sets of viscera

= shield

= carcasses

Illustration 1.)

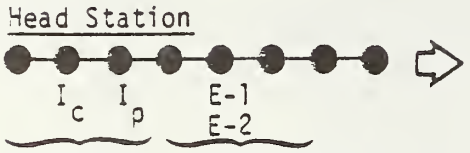


Illustration 2.)

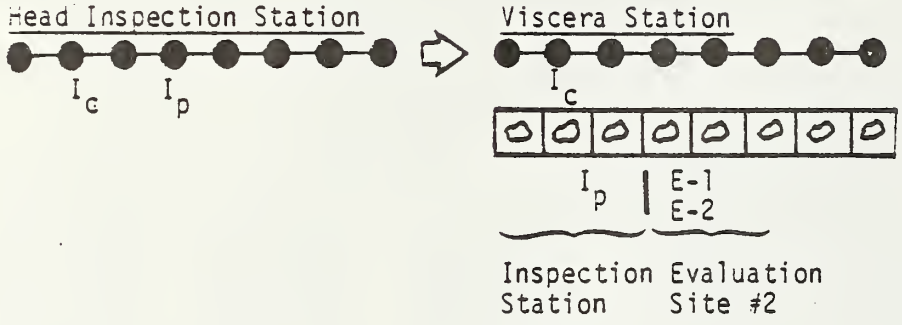


Illustration 3.)

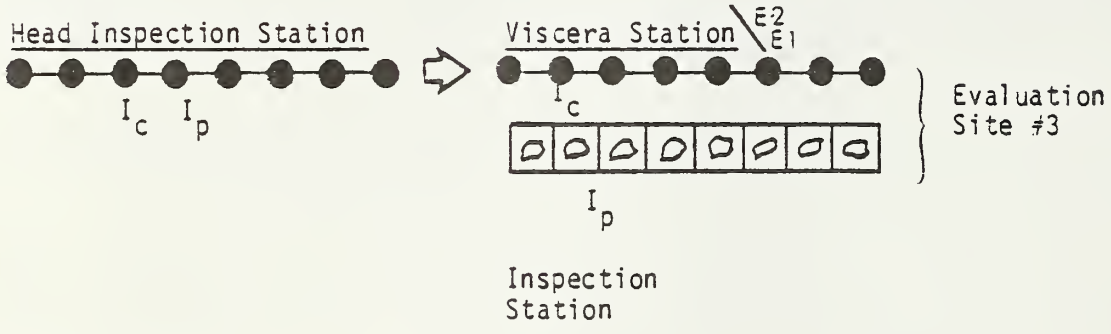


Illustration 4.)

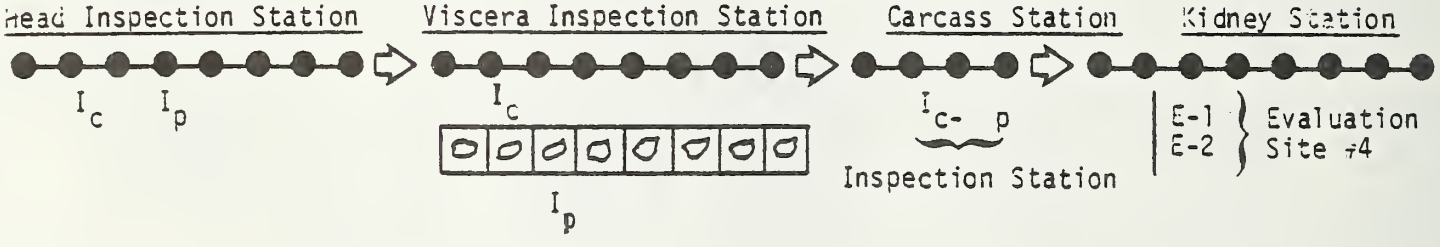
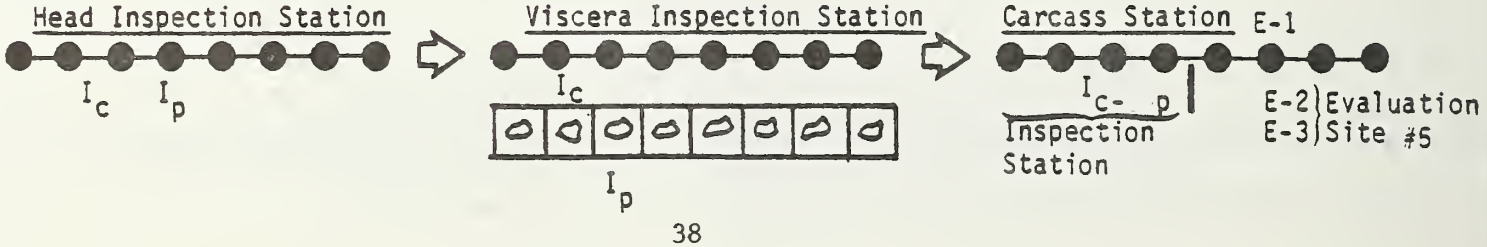


Illustration 5.)



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